



Forest Insect & Disease Management

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EVALUATION OF BALSAM WOOLLY APHID ON ROAN MOUNTAIN,
TOECANE RANGER DISTRICT, PISGAH NATIONAL FOREST, NORTH CAROLINA
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by

Patrick J. Barry
Supervisory Entomologist

Theodore M. Oprean III
Biological Technician

ABSTRACT

The Fraser fir (Abies fraseri (Pursh) Poir.) occurs on about 60,000 acres in the Southern Appalachian Mountains. It is a host of the balsam woolly aphid, Adelges piceae (Ratz.). Trees attacked by the adelgid will usually die within 2-6 years after attack. Work has been done in biological control of the adelgid and chemical control is impractical due to the inaccessibility of many of the areas where the Fraser fir type occurs. However, in recreation areas and highly visible areas it is both practical and desirable. Roan Mountain, Toecane Ranger District of the Pisgah National Forest is one such area where the Rhododendron Gardens and the alpine setting of the spruce-fir type draw thousands of visitors each year. Infestations of the balsam woolly aphid were first discovered on Roan Mountain in 1962. In 1978, aerial and ground surveys showed that the aphid infestations had spread significantly. It is recommended that the control effort on Roan Mountain be continued using either chemical, mechanical, cultural or a combination of these measures for control of the pest.

SOUTHEASTERN AREA, STATE & PRIVATE FORESTRY
USDA FOREST SERVICE, ATLANTA, GA 30309

INTRODUCTION

The Toecane Ranger District has identified three areas on Roan Mountain that are intensively used and highly visible to the public. A protection boundary of 200 feet on both sides of the road or trail on one of these areas is to be treated each year.

An aerial sketchmap survey and a ground examination were conducted by Forest Insect and Disease Management personnel to determine the extent and damage of the aphid on Roan Mountain. The aerial survey covered approximately 850 acres of spruce-fir type. About 400 acres were involved in the area sampled in the ground examination.

METHODS

A 100 percent aerial sketchmap survey was conducted over the Fraser fir-spruce type on Roan Mountain. Areas containing dead and dying fir were identified and outlined.

In the ground examination, five areas were sampled. These were: (1) State Highway 1348, (2) Balsam Road, (3) the Appalachian Trail, (4) the Roan High Bluff Trail, and (5) the Rhododendron Gardens. Plots were taken on both sides of the roads or trails within the 200 foot protection boundary at 1/10 mile intervals. They were point sample plots based on a BAF of 10. The number and species of all trees falling within the plots were recorded. All fir were examined closely for woolly wax egg masses and adults, and recorded as to whether or not they were infested. A total of 52 plots were sampled.

TECHNICAL INFORMATION

Insect - Balsam woolly aphid, Adelges piceae (Ratz.).

Hosts - Balsam woolly aphid was introduced from Europe around 1900. True firs are the only known host of the aphid. In the southeastern United States the bracted balsam fir (Abies balsamea var. phanervlepis Fern.) and the Fraser fir (A. fraseri (Pursh) Poir.) are the species affected.

Type of Damage - "Gouting" appears as a stunting of terminal growth swellings around the buds and branch nodes. Trees with this type of injury decline slowly. Growth is retarded and the dead and dying upper stem is often invaded by wood-destroying fungi. Bracted firs are mostly attacked by gout infestations.

Fraser fir is affected mostly by the more serious type of mass infestation along the stem. Stem attacked trees usually die within two to six years. The foliage on a dying tree turns yellow, then deep red or brown. While feeding, the aphid injects a substance into the bark that causes abnormal cell division. Obstruction of the water-conducting tissue seems to be the principal injury associated with stem infestations.

Life Cycle of the Aphid - The balsam woolly aphid reproduces by parthenogenesis as there are no males in North America. The adult female produces a wool-like material in which she lays amber-colored eggs. The eggs hatch into active crawlers which seek a place to feed and insert their mouth parts. Once the mouth parts are inserted the aphids will not move again. It transforms without moulting into neosistens. Two generations and a partial third usually develop in North Carolina. Long range spread is accomplished mainly by wind.

RESULTS AND DISCUSSION

The 1978 aerial survey found new dead and dying trees in the Rhododendron Gardens and an increasing, expanding infestation below and west of the Toll House Gap parking lot (Fig. 1). Most of the fir below Balsam Road is dead. This area is where the aphid was first discovered on Roan Mountain. Another large area of infestation extends up from Carver's Gap and includes the lower half of the Appalachian Trail. An area of dead fir extends from the loop in Forest Service Road 130 along the ridge to Eagle's Cliff. This area includes the Roan High Bluff Trail.

In 1978 fifty-six plots were established within the spray boundaries and sampled. Four plots in the Rhododendron Gardens of which two contained infested Fraser fir trees. Fourteen plots along State Highway 1348 which had no infested Fraser fir. Sixteen plots along the Appalachian Trail with two plots with infested Fraser fir. Eleven plots established along Balsam Road had two plots with infested Fraser fir, four plots along Roan High Bluff Trail with no infested plots and 7 plots along Forest Service Road 130 (Fig. 1).

In 1977 28 of 102 sample plots contained some infested fir. Heaviest concentrations of the aphid were found in plots along the lower portion of the Appalachian Trail and along the Balsam Road. Infested trees were also found in the Garden Area (Fig. 1).

Areas treated in 1977 were State Highway 1348 zone and the Rhododendron Gardens. Areas treated in 1978 were the Appalachian Trail from Toll House Gap to Carver's Gap. The Old Hotel Site, Toll House Picnic Area and from the trail from Forest Service Road 130 to Roan High Bluff (Fig. 1).

Retaining the Fraser fir in the three areas identified by the District, (State Highway 1348 and the Gardens, the Appalachian Trail and Roan High Bluff Trail, and Forest Service Road 130 and Balsam Road) will enhance and maintain the recreational value of Roan Mountain. In areas with a high percent of red spruce, the type can be converted by careful management and salvage to the species without a noticeable visual effect. However, in areas where the predominant type is Fraser fir, it will be necessary to conduct some preventive chemical control measures to prevent further spread of the aphid and to maintain the value of the area. Recommended

chemical control is to spray trees with a solution of 1/8 percent Lindane in water until the bark is drenched. Treatment should be applied in the spring between May and June, or in the fall during September and October when crawlers are present. Chemical control is effective for approximately three years.

RECOMMENDATIONS

It is recommended that:

1. A control project be continued for balsam woolly aphid on Roan Mountain.
2. Treatments should include applying a 1/8 percent solution of Lindane in water with a hydraulic sprayer to the trunk and branches of the tree to the point of runoff, and silvicultural management and removal of infested trees.
3. The areas to be treated during FY 1979 include approximately 150 acres of protected boundary. Seventy-five acres along Forest Service Road 130 from parking lot #1 through the loop and 75 acres along Forest Service Road 130-A (Balsam Road) (Fig. 1).

POST SUPPRESSION EVALUATION

The protection boundary along Balsam Road was treated during FY 1976. Basal area plots (10 factor) were established and examined in July 1977. Thirty percent of the total plots examined contained actively infested fir trees. Of the total number of fir trees within these plots, only 13 percent were infested. This indicated that the infestation within each infested plot was light. Microscopic examinations were also made of bark samples taken from infested trees within the spray area. These samples showed that partial control had been obtained on the actively infested trees. Results of the 1977 post suppression evaluation showed that approximately 87 percent control was obtained with chemical treatment.

The FY 1978 post suppression evaluation showed that 12 percent of the 56 plots contained some actively infested fir trees. Two of four plots in the Rhododendron Gardens contained actively infested trees. Three of the sixteen plots along the Appalachian Trail contained active trees. Two of eleven plots along Balsam Road contained active trees and four plots on Roan High Bluff Trail, seven plots on Forest Service Road 130 and fourteen plots along State Highway 1348 had no actively infested Fraser fir. Of the total number of fir trees in these plots (465), only 21 were actively infested. Only 4 percent of the trees within the protection boundaries are actively infested. This indicates that the control project is approximately 96 percent effective.



Figure 1: Spruce-fir type on Roan Mountain showing balsam woolly aphid infestations. Previously detected areas containing dead and dying fir are shown by the shaded area. New areas detected during the 1978 survey are shown by the cross hatching.

The following is a summary of stems and acres treated 1976 through 1978.

	<u>Mechanical</u>		<u>Chemical</u>	
	<u>Stems</u>	<u>Acres</u>	<u>Stems</u>	<u>Acres</u>
FY 1976	150	20	10,510	138
FY 1977	300	10	7,150	130
FY 1978	25	5	12,125	184

PRECAUTIONARY PESTICIDE USE STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key -- out of the reach of children and animals -- away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you use for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary land-fill dump, or crush and bury them in a level, isolated place.

NOTE: Some States have restrictions on the use of certain pesticides. Check your State and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Department of Agriculture, consult your county agricultural agent or State Extension specialist to be sure the intended use is still registered.